Process Architectures and Process Models: Opportunities for Reuse

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Abstract. Riva is a method for identifying two kinds of organisation process architecture: one based on essential business entities, the other on both essential business entities and designed business entities. Riva’s designer claims that organisations in the same business will have the same essential process architecture [5]. This implies that for another organisation of the same type an existing essential architecture can serve either as a starting point for designing its processes, or to assess both the completeness of its current processes and the appropriateness of the interrelationships between them. To assess these implications, the authors applied Riva to two higher education organisations in order to create both kinds of process architecture for higher education organisations. The process architectures were reviewed to assess their potential for reuse. The result was that process architectures derived from essential business entities seemed to have the greatest potential for reuse. The authors also considered the published guidelines for using a process architecture to develop models of its constituent processes. Here they found that abstract (as opposed to concrete) process models seemed to offer the greatest potential for reuse. Based on these results, the possibility was mooted of a catalogue of organisational process architectures and process models. Reference to such a catalogue might be incorporated by organisations into their strategies for reuse.

1 Introduction

A process architecture for an organisation identifies the processes that the organisation should develop; and it can also be used to guide their development to ensure that they interrelate correctly. As a consequence, Harmon [1] has recommended that a process architecture should be identified and modelled before individual processes are selected, modelled and supported by IT. But once in existence, such an architecture also seems to offer the possibility of reuse – reuse of the process architecture itself, of the processes developed from it, and of IT developed to support these processes. This paper assesses these suggestions through a case study in which the Riva process architecture method is applied to two higher education organisations and the resulting models are assessed for their reuse potential.

A number of process architecture methods have been proposed to date, including: Kavakli and Loucopoulos [2], Kawalek and Snowdon [3], Lunn et al. [4], and Ould [5]. An overview of each is provided by Green and Ould in [6]. Ould’s Riva method [5] in particular seems to offer the potential for reuse since its author claims that “a Riva process architecture is an invariant for an organisation that stays in the same business” [5]: in other words, two organisations in the same business will share the same process architecture. In practice Riva defines two kinds of process architecture: one is based upon just the essential business entities (EBEs) of the organisation, while the other is based upon both these and any designed business entities (DBEs). Essential business entities are the important abstract and concrete concepts associated with a business organisation; “they are there simply because of the business the organisation is in” [5]. Designed business entities on the other hand are things in the business that are there because of the way that the organisation chooses to do its business; they could be other than what they currently are for an organisation. Irrespective of the type of process architecture, once produced it may be used to guide the selection and subsequent modelling of its constituent processes; these in turn may be used to guide the selection and development of supporting IT systems. So, in theory at least, the potential exists for the following kinds of reuse:
• Reuse of an EBE-based architecture
• Reuse of an EBE+DBE-based architecture

The remainder of the paper presents the results of the authors’ application of Riva to organisations in the domain of Higher Education in the UK. Although this work did not extend to IT support, both kinds of architecture were produced.

2 Creating a Process Architecture

The Riva method for identifying an organisation’s process architecture is presented fully by Ould in [5]. In summary Riva comprises the following sequence of activities:

1. Agree the boundary of the organisation under consideration. (This is a crucial step as the placement of the boundary determines the set of EBEs for an organisation.)
2. Brainstorm the subject matter of the organisation to identify its EBEs.
3. Identify those EBEs that have a lifetime that the organisation must handle; these are called the essential units of work1 (EUOWs).
4. Create an EUOW diagram that shows dynamic relationships that pertain when one EUOW generates (calls for, demands, activates, etc.) another.
5. For each EUOW, hypothesise that there will be in the process architecture:
   6. A case process (CP) that deals with a single instance of the EUOW
   7. A case management process (CMP) that deals with the flow of instances
   8. A case strategy process (CSP) that determines the future strategy for both the case and case management processes. (CSPs are not considered further in this paper.)
9. Transform the EUOW diagram into corresponding 1st cut process architecture by turning the relationships between EUOWs into relationships between the corresponding CPs and CMPs.
10. Apply heuristics described by Ould [5] to the 1st cut architecture in order to transform it to the 2nd cut architecture.
11. At this point the process architecture based upon the EBEs has been created. It may be considered to be the most fundamental architecture because it is based upon the organisation’s EBEs. However, the preceding steps may now be repeated from step two, but this time including the designed business entities (DBEs) alongside the EBEs.

3 Process Architecture for Higher Education

The three authors applied the Riva method to higher education (HE) organisations using their own experiences of such organisations as their knowledge base. Following steps one to four (above), they agreed upon the EUOW diagram shown in fig. 1.

1 To determine the particular content of a case process, it is necessary to reflect upon the lifetime of the associated unit of work, an idea that seems similar to the Entity Life History concept from the Structured Systems Analysis and Design Method (SSADM): “Entity Life Histories document all of the events that can affect (i.e. cause a change to or constrain the life of) an entity” [7]
This structure is invariant in the sense that it can be applied to any type of University provision under any form of programme organisation. The EUOW diagram was converted to the 1st cut process architecture shown in fig. 2. 1st cut process architectures comprise many occurrences of the same simple structure relating two different case processes and a case management process. For example, fig. 2 shows that an instance of the case process for “Handle a T&L activity” requests the instance of the “Manage the flow of assessment events” case management process to start an instance of the case process “Handle an assessment event”, and also that the instance of the latter process delivers a result back to the “Handle a T&L activity”.
Application of Ould’s heuristics led to the 2nd cut process architecture shown in fig. 3.

We believe that this process architecture could be reused in any higher education organisation in order to derive its key processes, e.g. “Organise a teaching and learning activity” and “Provide an assessment event”, as well as the relationships between them.

Next, using the EUOW diagram as a starting point, two of the academics together created an essential and designed unit of work (E+DUOW) diagram that reflected the nature of one of the higher education institutions (UWE), while the third academic carried out the same exercise for the other (Bath). The resulting E+DUOW diagram for Bath is shown in fig. 4.
The two diagrams (the one for UWE is not shown here) differed because some DBEs at Bath were not present at UWE and vice versa; this is because in some areas the two universities had chosen to do some things differently. In particular, UWE has moved more strongly to a modular form of programme management, whereas Bath’s degrees are traditional linear awards. Thus the UOW “Degree Programme Cohort” (i.e. the year group on a degree course) has a meaningful existence at Bath because students are awarded credit on the basis of their results across all units taken in an academic year. At UWE credit is awarded on a module-by-module basis: “cohorts” have no formal existence, but instead there are students on degree programmes accumulating credits at different speeds.

Ideas have arisen in the course of analysis about how the translation from EUOW to E+DUOW diagram can take place. At present, we have followed Ould’s implication that the designed business entities will sit alongside the essential entities [5]. But it is possible that some, at least, of the EBEs will be better represented as collections of designed entities and not exist on the diagram separately from them. For example, “Curriculum” may be a collection of degree programmes and units/modules rather than having a formal existence. Therefore, it may exist on the EUOW diagram, but be disaggregated into component parts in a diagram that illustrates the designed units of work. For this stage in the analysis, we have chosen not to take this step, but it remains an option for future development.

The 1st and 2nd cut process architectures derived from the Bath E+DUOW diagram are shown in fig. 5 and fig. 6.

We believe that the essential process architecture and any associated architectures based also on designed business entities could provide a useful starting point for developing the processes for a new higher education organisation, or for mapping to an existing higher education organisation in order to appraise its current architecture. It should be borne in mind that the particular process architecture shown here in fig. 5 and fig. 6 will fit some types of university better than others – specifically those with linear degrees in which students progress to the next stage as a cohort. More modular institutions will include a different set of DBEs, or different relations between them.
Fig. 5. 1st cut E+DUOW-based process architecture for Bath
Any use of these models as generic process architectures, however, would need to take into account the different vocabularies used even at universities of the same type. Bath, for instance, uses the word “Unit” where most institutions would say “Module”. More awkwardly, different words will be used to signify what are sometimes called “programmes”, “degrees”, “awards” or “courses”. Designers of generic process architectures need to be aware of the different contexts in which apparently similar organisations operate and therefore they need considerable domain knowledge in order to produce diagrams which can be adapted to particular situations.

4 Process Models for Higher Education

Our work to date has not yet addressed the development of processes identified in a process architecture. So this paper does not include an account of practical work on this topic. However, Ould [5] presents detailed guidelines for developing process models for processes identified in a process architecture. Such process models – termed Role Activity Diagrams (RADs) – are created from the basic building blocks of role, action, interaction, and event. Whatever the purpose of modelling – process creation, process understanding, process improvement, etc. – two kinds of process model may be created: an abstract process model and a concrete process model. An abstract process model is intended to capture the intent of roles, action, interactions and events for a modelled process; while a concrete process model is intended to capture mechanisms. For example, in a hypothetical abstract process model, one action might be: “Create definitive documentation”; its concrete counterpart might be, for example: “Complete online form 21A located at www. etc.”
The existence of abstract and concrete process models seems to offer the potential for four further kinds of reuse:

- Reuse of EBE-based abstract processes
- Reuse of EBE-based concrete processes
- Reuse of EBE+DBE-based abstract processes
- Reuse of EBE+DBE-based concrete processes

Clearly abstract process models are better suited for reuse than concrete process models. This is because, intuitively, one would expect it to be easier both to understand and make concrete an abstract process model for a given organisation than it would be to understand a concrete model, decontextualise it, discover its essence, and make it concrete for a new organisational context.

Our work to date has also not addressed IT support for processes, but clearly the potential exists here for two further kinds of reuse:

- Reuse of EBE-based IT
- Reuse of EBE+DBE-based IT

5 Conclusion

The authors believe that the initial focus of Riva upon the EBEs of an organisation provides a sound basis for identifying process architectures for organisations. And because such PAs are soundly derived, it seems sensible to reuse them either for developing new instances of an organisation, or for critiquing existing instances with a view to improvement, or even for simply helping to understand the structure of existing processes and their interrelationships. In addition, for the same reason, it also seems sensible to reuse either concrete or abstract process models derived from such process architectures. For example, to exploit reuse in order to design a new organisation of a given type, e.g. a new HE institution, in a green field context, the process architecture based upon just the EBEs might be taken as a starting point. To the associated EUOW diagram, DBEs agreed for the new organisation could be added and a new process architecture derived from the result. Abstract process models based on the essential architecture could be taken as a starting point for designing corresponding concrete process models. Abstract and concrete process models supporting the chosen DBEs would need to be developed ab initio.

The direction of this work opens up the prospect of a catalogue of both EBE- and EDBE-based process architectures and abstract and concrete processes that might contain entries for different types of organisation. Such a catalogue might be consulted as part of an organisation’s strategy for reuse in the interests of efficient and effective process development.

In work elsewhere that exemplifies the use of a process architecture for the critiquing of existing instances of processes, Zaheer, Odeh, and Solomonides [8] have used Riva to identify a process architecture and processes for the domain of digital libraries; the resulting PA and processes have been used to critique process designs associated with existing digital libraries.

References